

Atty's 22725

Pat. App. 10/766,513

SPECIFICATION AMENDMENTS

Please correct the Specific Description running from line 1 of page 6 to line 12 of page 8 as follows:

SPECIFIC DESCRIPTION

As seen in FIGS. 1 and 2 a plate workpiece 1 is held in ~~[[an]]~~ a forming apparatus 2 comprised of a stationary die 3 formed with a square-section cavity 5 in which a punch 4 can slide in parallel directions P_1 and P_2 . One planar interior surface 16 of the cavity 5 is set back and forms a shoulder 6 directed backward in the direction P_2 and a confronting planar surface 15 of the punch ~~[[5]]~~ 4 is cut back to form a shoulder 7 confronting the shoulder 6. The punch 4 fits complementarily in the cavity 5 and is only spaced from it at the surfaces 15 and 16 between the shoulders 6 and 7 in a rectangular region having a constant depth d_1 measured transverse to the directions P_1 and P_2 equal to the thickness of a plate-shaped metal blank 1.

The shoulders 6 and 7 are planar and can be perpendicular to the directions P_1 and P_2 but preferably are canted at a slight angle thereto so that they converge outward away from the punch 4. The punch surface 15 is roughened to increase friction forward, that is downward in the drawing from the shoulder 7 but

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the confronting surface 16 of the cavity 5 upward of the shoulder 6 is machined smooth.

In addition the die 3 is provided with an abutment 10 having a planar face exposed in the cavity 5 and displaceable perpendicular to the directions P_1 and P_2 in a passage 9 away from the cavity 5 against the force of a powerful compression spring 11. A pressurized hydraulic fluid could replace the spring 11. A stop or spacer 14 is provided in the die 13 for engagement with a rear face 13 of the abutment 10 to limit its movement away from the cavity 5.

In use the punch 4 is pulled completely out of the die 3. Then the punch 4 is fitted to the cavity 5 with its shoulder spaced retracted far enough to space its shoulder 7 outside the die 3 by a distance equal to at least a length or height h_1 of the plate 1 measured parallel to its plane. The punch 4 is pushed downward in the direction P_1 until the leading edge of the plate 1 engages the shoulder 6. Further force applied in the direction P_1 will longitudinally compress the plate 1 into a workpiece 1a which deforms outward into the passage 9, pressing back the abutment 10 against the force of its spring 11 until it seats against the stop 14. During this compression, which is applied longitudinally and causes the workpiece to extrude transversely, the back face of the workpiece plate 1 is

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in full surface contact with the rough surface 15 of the punch 4. This forms a bump 12 on the workpiece 1a having a shape corresponding to that of the passage [[15]] 9, the bump 12 having a planar end face like the end of the abutment 10. The finished workpiece has a height h_2 that is less than the height h_1 . The slight canting of the two edges or shoulders 6 and 7, the roughness of the punch surface 15, and the smoothness of the surface 16 ensure that the workpiece 1 will slide along the die 3 and lie flat against the punch 4.

FIGS. 3, 4, and 5 show how this system can be applied to a workpiece 17 to provided it with central thickened regions 18. These thickenings increase strength at critical corner and edge regions, while the rest of the workpiece 17 is left thin so that it is quite light.

FIG. 6 shows how in the prior art two plates 19 and 20 are welded together at 21. This action erodes the plates 19 and 20 at 22 reducing plate thickness s and thereby weakening the plate 19 locally.

According to the invention a similar weld at 25 between two plates 23 and 24 is effected where the plate 23 has been thickened so that no thickness is lost.